

# Final Report

## *Appendices A to D*

### 2021 CITYWIDE ENGINEERING AND TRAFFIC SURVEY



December 2021



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# **APPENDIX A**

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## **Regulations Governing Speed Limits and Definition of Terms**

*Excerpts from California Vehicle Code*



## **RADAR SPEED ZONE SURVEYS**

September 2020

### **Introduction**

This report presents the results of a traffic and engineering study for establishment of speed limits on city streets as required by Sections 22357 and 22358 of the California Vehicle Code. The review included radar surveys of prevailing vehicle speeds at various locations along the length of each street, recent traffic counts and an analysis of reported traffic accidents recorded during the specific interval.

In order to enforce speed limits by radar or other electronic devices, a study must be conducted every five years. Section 40802 of the California Vehicle Code defines a speed limit enforced by radar and "...which speed limit is not justified by an engineering and traffic survey conducted within five years prior to the date of the alleged violation..." constitutes a speed trap, unless the following criteria are met:

If officers have completed specialized training courses that are approved by the Commission on Peace Officer Standards Training, the time span between studies can be extended to seven years.

If after seven years, "...a registered engineer evaluates the section of the highway and determines that no significant changes in roadway or traffic conditions have occurred, including, but not limited to, changes in adjoining property or land use, roadway width, or traffic volume..." the time span between studies can be extended to ten years.

Since speed traps are illegal, the lack of an adequate study effectively precludes the police from using radar enforcement. Through adoption of this study, the police department will be able to enforce posted speed limits with radar equipment.

It is a common belief that posting of speed limit traffic signs will influence drivers to drive at that speed. The facts indicate otherwise.

Driver behavior research conducted in many parts of this country, over a span of several decades; shows that the average driver is influenced by the appearance of the highway itself and the prevailing traffic conditions, in choosing the speed at which he or she drives. Recognizing this, the California Vehicle Code requires that speed limits be established in accordance with appropriate engineering practice and methods.

### **Regulations Governing Speed Limits**

Under California law, the maximum speed limit for any passenger vehicle is 65 miles per hour (mph). All other speed limits are called prima facie limits which "on the face of it", are safe and prudent under normal conditions. Certain prima facie limits are established by law and include the 25 miles per hour limit in business and residential districts (CVC515); the 15 miles per hour limit in alleys, at blind intersections, and blind railroad grade crossings; and a part-time 25 miles per hour in school zones when children are going to and from school.

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Intermediate speed limits between 25 and 65 miles per hour may be established by local authorities based on traffic engineering surveys. Such surveys include the analysis of roadway conditions, accident records, and the prevailing speed of prudent drivers using the highway under study. If speed limits are established below what the majority of drivers consider reasonable, they are often not obeyed and consequently, are difficult to enforce. Those drivers who do not comply with posted reasonable speed limits are, conversely, subject to equitable enforcement action.

The California Vehicle Code provides that the use of radar to enforce speed limits, which have not been based on a traffic and engineering study within the preceding five years, constitutes a “speed trap”. Since speed traps are also prohibited by the code, lack of the required study effectively prohibits local agencies from using radar enforcement.

### **Applicable Vehicle Code Sections**

#### Business District

235. A “business district: is that portion of a highway and the property contiguous thereto (a) upon one side of which highway, for a distance of 600 feet, 50 percent of more of the contiguous property fronting thereon is occupied by buildings in use for business, or (b) upon both sided of which highway, collectively, for a distance of 300 feet, 50 percent or more of the contiguous property fronting thereon is so occupied. A business district may be longer than the distance specified in this section if the above ratio of buildings in use for business to the length of the highway exists.

#### Business and Residence District: Determination

240. In determining whether a highway is within a business or residence district, the following limitations shall apply and shall qualify the definitions Section 235 and 515:
- a) No building shall be counted unless its entrance faces the highway and the front of the building is within 75 feet of the roadway.
  - b) Where a highway is physically divided into two or more roadways, only those buildings facing each roadway separately shall be counted for the purpose of determining whether the roadway is within a district.
  - c) All churches, apartments, hotels, multiple dwelling houses, clubs and public buildings, other than schools, shall be deemed to be business structures.
  - d) A highway or portion of a highway shall not be deemed to be within a district regardless of the number of buildings upon the contiguous property if there is no right of access to the highway by vehicles from the contiguous property.

#### Residence District

515. A “residence district” is that portion of a highway and the property contiguous thereto, other than a business district, (a) upon one side of which highway, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 13 or more separate dwelling houses or business structures, or (b) upon both sided of which highway, collectively, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 16 or more separate dwelling housed or business structures. A residence district may be longer than one quarter of a mile if the above ratio of separate dwelling houses or business structures to the length of the highway exists.

#### Engineering and Traffic Survey

627. (a) “Engineering and traffic survey” as used in this Code, means a survey of highway and traffic

- conditions in accordance with methods determined by the Department of Transportation for use by the state and local authorities.
- (b) An engineering and traffic survey shall include, among other requirements deemed necessary by the department, consideration of all the following:
    - 1) Prevailing speeds as determined by traffic engineering measurements.
    - 2) Accident records.
    - 3) Highway, traffic, and roadside conditions not readily apparent to the driver.
  - (c) When conducting an engineering and traffic survey, local authorities, in addition to the factors set forth in paragraphs (1) to (3), inclusive, of subdivision (b) may consider all of the following:
    - 1) Residential density, if any of the following conditions exist on the particular portion of highway and the property contiguous thereto, other than a business district:
      - (A) Upon one side of the highway, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 13 or more separate dwelling houses or business structures.
      - (B) Upon both sides of the highway, collectively, within a distance of a quarter of a mile, the contiguous property fronting thereon is occupied by 16 or more separate dwelling houses or business structures.
      - (C) The portion of highway is longer than one-quarter of a mile but has the ratio of separate dwelling houses or business structures to the length of the highway described in either subparagraph (A) or (B).
    - 2) Pedestrian and bicyclist safety.

Rounding Speed Limit to the Nearest 5 mph of the 85<sup>th</sup> Percentile

21400. (a) (1) The Department of Transportation shall, after consultation with local agencies and public hearings, adopt rules and regulations prescribing uniform standards and specifications for all official traffic control devices placed pursuant to this code, including, but not limited to, stop signs, yield right-of-way signs, speed restriction signs, railroad warning approach signs, street name signs, lines and markings on the roadway, and stock crossing signs placed pursuant to Section 21364.
- (2) The Department of Transportation shall, after notice and public hearing, determine and publicize the specifications for uniform types of warning signs, lights, and devices to be placed upon a highway by a person engaged in performing work that interferes with or endangers the safe movement of traffic upon that highway.
- (3) Only those signs, lights, and devices as are provided for in this section shall be placed upon a highway to warn traffic of work that is being performed on the highway.
- (4) Control devices or markings installed upon traffic barriers on or after January 1, 1984, shall conform to the uniform standards and specifications required by this section.
- (b) The Department of Transportation shall revise the California Manual on Uniform Traffic Control Devices, as it read on January 1, 2012, to require the Department of Transportation or a local authority to round speed limits to the nearest five miles per hour of the 85th percentile of the free-flowing traffic. However, in cases in which the speed limit needs to be rounded up to the nearest five miles per hour increment of the 85th-percentile speed, the Department of Transportation or a local authority may decide to instead round down the speed limit to the lower five miles per hour increment, but then the Department of Transportation or a local authority shall not reduce the speed limit any further for any reason.

### Maximum Speed Limit

22349. (a) Except as provided in Section 22356, no person shall drive a vehicle upon a highway at a speed greater than 65 miles per hour.
- (b) Notwithstanding any other provision of law, no person may drive a vehicle upon a two-lane, undivided highway at a speed greater than 55 miles per hour unless that highway, or portion thereof, has been posted for a higher speed by the Department of Transportation or appropriate local agency upon the basis of an engineering and traffic survey. For purposes of this subdivision, the following apply:
- (1) A two-lane, undivided highway is a highway with not more than one through lane of travel in each direction.
  - (2) Passing lanes may not be considered when determining the number of through lanes.
- (c) It is the intent of the Legislature that there be reasonable signing on affected two-lane, undivided highways described in subdivision (b) in continuing the 55 miles-per-hour speed limit, including placing signs at county boundaries to the extent possible, and at other appropriate locations.

### Basic Speed Law

22350. No person shall drive a vehicle upon a highway at a speed greater than is reasonable or prudent having due regard for weather, visibility, the traffic on, and surface and width of, the highway, and in no event at a speed which endangers the safety of persons or property.

### Speed Law Violations

22351. (a) The speed of any vehicle upon a highway not in excess of the limits specified in Section 22352 or established as authorized in this code is lawful unless clearly proved to be in violation of the basic speed law.
- (b) The speed of any vehicle upon a highway in excess of the prima facie speed limits in Section 22352 or established as authorized in this code is prima facie unlawful unless the defendant establishes by competent evidence that the speed in excess of said limits did not constitute a violation of the basic speed law at the time, place and under the conditions then existing.

### Prima Facie Speed Limits

22352. The prima facie limits are as follows and the same shall be applicable unless changed as authorized in this code and, if so changed, only when signs have been erected giving notice thereof:

- (a) Fifteen miles per hour:
  - 1) When traversing a railway grade crossing, if during the last 100 feet of the approach to the crossing the driver does not have a clear and unobstructed view of the crossing and of any traffic on the railway for a distance of 400 feet in both directions along such railway. This subdivision does not apply in the case of any railway grade crossing where a human flagman is on duty or a clearly visible electrical mechanical railway crossing signal device is installed but does not then indicate the immediate approach of a railway train or car.
  - 2) When traversing any intersection of highways if during the last 100 feet of the driver's approach to the intersection the driver does not have a clear and unobstructed view of the intersection and of any traffic upon all of the highways entering the intersection for a distance of 100 feet along all those highways, except at an intersection protected by stop signs or yield right-of-way signs or controlled by official traffic control signals.
  - 3) On any alley.
- (b) Twenty-five miles per hour:

- 1) On any highway other than a state highway, in any business or residence district unless a different speed is determined by local authority under procedures set forth in this code.
- 2) When approaching or passing a school building or the grounds thereof, contiguous to a highway and posted with a standard "SCHOOL" warning sign, while children are going to or leaving the school either during school hours or during the noon recess period. Such prima facie limit shall also apply when approaching or passing any school grounds which are not separated from the highway by a fence, gate or other physical barrier while the grounds are in use by children and the highway is posted with a standard "SCHOOL" warning sign. For purposes of this subparagraph, standard "SCHOOL" warning signs may be placed at any distance up to 500 feet away from school grounds.
- 3) When passing a senior center or other facility primarily used by senior citizens, contiguous to a street other than a state highway and posted with a standard "SENIOR" warning sign. A local authority may erect a sign pursuant to this paragraph when the local agency makes a determination that the proposed signing should be implemented. A local authority may request grant funding from the Active Transportation Program pursuant to Chapter 8 (commencing with Section 2380) of Division 3 of the Streets and Highways Code, or any other grant funding available to it, and use that grant funding to pay for the erection of those signs, or may utilize any other funds available to it to pay for the erection of those signs, including, but not limited to, donations from private sources.

#### Increase of Local Limits

22357. (a) Whenever a local authority determines upon the basis of an engineering and traffic survey that a speed greater than 25 miles per hour would facilitate the orderly movement of vehicular traffic and would be reasonable and safe upon any street other than a state highway otherwise subject to a prima facie limit of 25 miles per hour, the local authority may by ordinance determine and declare a prima facie limit of 25 miles per hour, the local authority may by ordinance determine and declare a prima facie speed limit of 30, 35, 40, 45, 50, 55, 60 miles per hour or a maximum speed limit of 65 miles per hour, whichever is found most appropriate to facilitate the orderly movement of traffic and is reasonable and safe. The declared prima facie or maximum speed limit shall be effective when appropriate signs giving notice thereof are erected upon the street and shall not thereafter be revised except upon the basis of an engineering and traffic survey. This section does not apply to any 25-mile-per-hour prima facie limit which is applicable when passing a school building or the grounds thereof or when passing a senior center or other facility primarily used by senior citizens.

#### Decrease of Local Limits

22358. (a) Whenever a local authority determines upon the basis of an engineering and traffic survey that the limit of 65 miles per hour is more than is reasonable or safe upon any portion of any street other than a state highway where the limit of 65 miles per hour is applicable, the local authority may by ordinance determine and declare a prima facie speed limit of 60, 55, 50, 45, 40, 35, 30, or 25 miles per hour, whichever is found most appropriate to facilitate the orderly movement of traffic and is reasonable and safe, which declared prima facie limit shall be effective when appropriate signs giving notice thereof are erected upon the street.
- (b) This section shall become operative on the date specified in subdivision (c) of Section 22366.

Decrease on Narrow Street

22358.3. Whenever a local authority determines upon the basis of an engineering and traffic survey that the prima facie speed limit of 25 miles per hour in a business or residence district or in a public park on any street having a roadway not exceeding 25 feet in width, other than a state highway, is more than is reasonable or safe, the local authority may, by ordinance or resolution, determine and declare a prima facie speed limit of 20 or 15 miles per hour, whichever is found most appropriate and is reasonable and safe. The declared prima facie limit shall be effective when appropriate signs giving notice thereof are erected upon the street.

Decrease on Local Streets Near Schools or Senior Centers

- 22358.4. (a) (1) Whenever a local authority determines upon the basis of an engineering and traffic survey that the prima facie speed limit of 25 miles per hour established by subdivision (b) of Section 22352 is more than is reasonable or safe, the local authority may, by ordinance or resolution, determine and declare a prima facie speed limit of 20 or 15 miles per hour, whichever is justified as the appropriate speed limit by that survey.
- (2) An ordinance or resolution adopted under paragraph (1) shall not be effective until appropriate signs giving notice of the speed limit are erected upon the highway and, in the case of a state highway, until the ordinance is approved by the Department of Transportation and the appropriate signs are erected upon the highway.
- (b) (1) Notwithstanding subdivision (a) or any other provision of law, a local authority may, by ordinance or resolution, determine and declare prima facie speed limits as follows:
- (A) A 15 miles per hour prima facie limit in a residence district, on a highway with a posted speed limit of 30 miles per hour or slower, when approaching, at a distance of less than 500 feet from, or passing, a school building or the grounds of a school building, contiguous to a highway and posted with a school warning sign that indicates a speed limit of 15 miles per hour, while children are going to or leaving the school, either during school hours or during the noon recess period. The prima facie limit shall also apply when approaching, at a distance of less than 500 feet from, or passing, school grounds that are not separated from the highway by a fence, gate, or other physical barrier while the grounds are in use by children and the highway is posted with a school warning sign that indicates a speed limit of 15 miles per hour.
- (B) A 25 miles per hour prima facie limit in a residence district, on a highway with a posted speed limit of 30 miles per hour or slower, when approaching, at a distance of 500 to 1,000 feet from, a school building or the grounds thereof, contiguous to a highway and posted with a school warning sign that indicates a speed limit of 25 miles per hour, while children are going to or leaving the school, either during school hours or during the noon recess period. The prima facie limit shall also apply when approaching, at a distance of 500 to 1,000 feet from, school grounds that are not separated from the highway by a fence, gate, or other physical barrier while the grounds are in use by children and the highway is posted with a school warning sign that indicates a speed limit of 25 miles per hour.
- (2) The prima facie limits established under paragraph (1) apply only to highways that meet all of the following conditions:
- (A) A maximum of two traffic lanes.
- (B) A maximum posted 30 miles per hour prima facie speed limit immediately prior to and after the school zone.
- (3) The prima facie limits established under paragraph (1) apply to all lanes of an affected



highway, in both directions of travel.

- (4) When determining the need to lower the prima facie speed limit, the local authority shall take the provisions of Section 627 into consideration.
- (5) (A) An ordinance or resolution adopted under paragraph (1) shall not be effective until appropriate signs giving notice of the speed limit are erected upon the highway and, in the case of a state highway, until the ordinance is approved by the Department of Transportation and the appropriate signs are erected upon the highway.  
(B) For purposes of subparagraph (A) of paragraph (1), school warning signs indicating a speed limit of 15 miles per hour may be placed at a distance up to 500 feet away from school grounds.  
(C) For purposes of subparagraph (B) of paragraph (1), school warning signs indicating a speed limit of 25 miles per hour may be placed at any distance between 500 and 1,000 feet away from the school grounds.  
(D) A local authority shall reimburse the Department of Transportation for all costs incurred by the department under this subdivision.

#### Downward Speed Zoning

22358.5 It is the intent of the Legislature that physical conditions such as width, curvature, grade and surface conditions or any other condition readily apparent to a driver, in the absence of other factors, would not require special downward speed zoning, as the basic rule of Section 22350 is sufficient regulation as to such conditions.

#### Boundary Line Streets

22359. With respect to boundary line streets and highways where portions thereof are within different jurisdictions, no ordinance adopted under Sections 22357 and 22358 shall be effective as to any such portion until all authorities having jurisdiction of the portions of the street concerned have approved the same. This section shall not apply in the case of boundary line streets consisting of separate roadways within different jurisdictions.

#### Multiple-Lane Highways

22361. On multiple-lane highways with two or more separate roadways, different prima facie speed limits may be established for different roadways under any of the procedures specified in Sections 22354 to 22359, inclusive.

#### Speed Trap Prohibition

40801. No peace officer or other person shall use a speed trap in arresting, or participating or assisting in the arrest of, any person for any alleged violation of this code nor shall any speed trap be used in securing evidence as to the speed of any vehicle for the purpose of an arrest or prosecution under this code.

#### Speed Trap

40802. (a) A "speed trap" is either of the following:
- (1) A particular section of a highway measured as to distance and with boundaries marked, designated, or otherwise determined in order that the speed of a vehicle may be calculated by securing the time it takes the vehicle to travel the known distance.
  - (2) A particular section of a highway with a prima facie speed limit provided by this code or by local ordinance pursuant to paragraph (1) of subdivision (b) of Section 22352, or established under Section 22354, 22357, 22358, or 22358.3, if that prima facie speed

limit is not justified by an engineering and traffic survey conducted within five years prior to the date of the alleged violation, and enforcement of the speed limit involves the use of radar or any other electronic devices which measures the speed of moving objects. This subdivision does not apply to local street, road, or school zone.

- (b) (1) For purposes of this section, a local street or road is one that is functionally classified as "local" on the "California Road System Maps" that are approved by the Federal Highway Administration and maintained by the Department of Transportation. When a street or road does not appear on the "California Road System Maps," it may be defined as a "local street or road" if it primarily provides access to abutting residential property and meets the following three conditions:
  - (A) Roadway width of not more than 40 feet.
  - (B) Not more than one-half mile of uninterrupted length. Interruptions shall include official traffic control devices as defined in Section 445.
  - (C) Not more than one traffic lane in each direction.
- (2) For purposes of this section, "school zone" means that area approaching or passing a school building or the grounds thereof that is contiguous to a highway and on which is posted a standard "SCHOOL" warning sign, while children are going to or leaving the school either during school hours or during the noon recess period. "School zone" also includes the area approaching or passing any school grounds that are not separated from the highway by a fence, gate, or other physical barrier while the grounds are in use by children if that highway is posted with a standard "SCHOOL" warning sign.
- (c) (1) When all of the following criteria are met, paragraph (2) of this subdivision shall be applicable and subdivision (a) shall not be applicable:
  - (A) When radar is used, the arresting officer has successfully completed a radar operator course of not less than 24 hours on the use of police traffic radar, and the course was approved and certified by the Commission on Peace Officer Standards and Training.
  - (B) When laser or any other electronic device is used to measure the speed of moving objects, the arresting officer has successfully completed the training required in subparagraph (A) and an additional training course of not less than two hours approved and certified by the Commission on Peace Officer Standards and Training.
  - (C)(i) The prosecution proved that the arresting officer complied with subparagraphs (A) and (B) and that an engineering and traffic survey has been conducted in accordance with subparagraph (B) of paragraph (2). The prosecution proved that, prior to the officer issuing the notice to appear, the arresting officer established that the radar, laser, or other electronic device conformed to the requirements of subparagraph (D).
  - (ii) The prosecution proved the speed of the accused was unsafe for the conditions present at the time of alleged violation unless the citation was for a violation of Section 223469, 22356, or 22406.
  - (D) The radar, laser, or other electronic device used to measure the speed of the accused meets or exceeds the minimal operational standards of the National Traffic Highway Safety Administration, and has been calibrated within the three years prior to the date of the alleged violation by an independent certified laser or radar repair and testing or calibration facility.
- (2) A "speed trap" is either of the following:

- (A) A particular section of a highway measured as to distance and with boundaries marked, designated, or otherwise determined in order that the speed of a vehicle may be calculated by securing the time it takes the vehicle to travel the known distance.
- (B) (i) A particular section of a highway or state highway with a prima facie speed limit that is provided by this code or by local ordinance under paragraph (1) of subdivision (b) of Section 22352, or established under Section 22354, 22357, 22358, or 22358.3, if that prima facie speed limit is not justified by an engineering and traffic survey conducted within one of the following time periods, prior to the date of the alleged violation, and enforcement of the speed limit involves the use of radar or any other electronic device that measures the speed of moving objects:
  - (I) Except as specified in subclause (II), seven years.
  - (II) If an engineering and traffic survey was conducted more than seven years prior to the date of the alleged violation, and a registered engineer evaluates the section of the highway and determines that no significant changes in roadway or traffic conditions have occurred, including, but not limited to, changes in adjoining property or land use, roadway width, or traffic volume, 10 years.
- (ii) This subparagraph does not apply to a local street, road, or school zone.

#### Speed Trap Evidence.

40803. (a) No evidence as to the speed of a vehicle upon a highway shall be admitted in any court upon the trial of any person in any prosecution under this code upon a charge involving the speed of a vehicle when the evidence is based upon or obtained from or by the maintenance or use of a speed trap
- (b) In any prosecution under this code of a charge involving the speed of a vehicle, where enforcement involves the use of radar or other electronic devices which measure the speed of moving objects, the prosecution shall establish, as part of its prima facie case, that the evidence or testimony presented is not based upon a speed trap as defined in paragraph (2) of subdivision (b) of Section 40802.
- (c) When a traffic and engineering survey is required pursuant to paragraph (2) of subdivision (b) of Section 40802, evidence that a traffic and engineering survey has been conducted within five years of the date of the alleged violation or evidence that the offense was committed on a local street or road as defined in paragraph (2) of subdivision (b) of Section 40802 shall constitute a prima facie case that the evidence or testimony is not based upon a speed trap as defined in paragraph (2) of subdivision (b) 40802.

#### **Study Method**

Speed zones are established to inform drivers of the safe speed limit and to protect the general public from unreasonable and reckless drivers. Research has shown that most drivers travel at speeds that are safe and reasonable, therefore, speed limits are established primarily on the consensus of the majority of those who use the roads. Speed limits are not based on the actions of few. The California Vehicle Code requires the limits to be established on the basis of an engineering and traffic survey rather than by arbitrary methods.

The study is conducted in accordance with the appropriate sections of the California Vehicle Code and the California Manual on Uniform Traffic Control Devices (CA MUTCD), Section 2B-13, Speed Limit Sign (R2-D)

Surveys are conducted on arterial streets, collector streets, and selected local streets. Each of the selected streets was analyzed individually.

The accident analysis was based on a review of the City's Traffic Accident Records (Crossroads). Only non-intersection accidents are included since intersection accidents are considered correctable using conventional intersection traffic controls such as stop signs or traffic signals.

Accident rates were computed using a formula that takes into account the number of accidents in the two-year period, the length of roadway being studied, and the average daily traffic volume. The rate is expressed in accidents per million vehicle miles (Acc/MVM). The formula is:

$$\text{Acc/MM} = \frac{\text{Number of Accidents} \times 1,000,000}{\text{Distance} \times \text{ADT} \times \text{No. of Days}}$$

In order to evaluate the accident rates for each street segment, the average rate for all surveyed street segments was calculated. Average rates were calculated for two-lane and four-or-more-lane arterial streets, two-lane collector and two-lane local streets. The accident rates for each segment were compared to the state-wide average rates for streets with similar characteristics.

### Definitions of Terms

Average Daily Traffic	Volume of traffic during a 24-hour period.
ECL	Easterly City Limit (also WCL, NCL and SCL for Westerly, Northerly and Southerly).
85 <sup>th</sup> Percentile (Critical Speed)	The "speed" which 85% of the observed vehicles are not exceeding. This speed is usually within 2 mph of the upper limit of the speed.
Mean Speed	The average speed.
MPH or mph	Miles Per Hour.
MVM or mvm	Million Vehicle Miles. Accident rates are generally expressed as the number of accidents occurring per million vehicle miles traveled during a given time period.
Pace	The 10 mph range of observed vehicle speeds containing the largest number of vehicles. A normal distribution will contain approximately 70% of the sample within the pace, with 15% above and 15% below.

## **APPENDIX B**

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### **Speed Zoning Regulations from Caltrans** *California Manual on Uniform Traffic Control Devices*



**04 If used, the Overhead Pedestrian Crossing sign shall be placed over the roadway at the crosswalk location.**

**05 An In-Street or Overhead Pedestrian Crossing sign shall not be placed in advance of the crosswalk to educate road users about the State law prior to reaching the crosswalk, nor shall it be installed as an educational display that is not near any crosswalk.**

*Guidance:*

*06 If an island (see Chapter 3I) is available, the In-Street Pedestrian Crossing sign, if used, should be placed on the island.*

*Option:*

*07 If a Pedestrian Crossing (W11-2) warning sign is used in combination with an In-Street or an Overhead Pedestrian Crossing sign, the W11-2 sign with a diagonal downward pointing arrow (W16-7P) plaque may be post-mounted on the right-hand side of the roadway at the crosswalk location.*

**Standard:**

**08 The In-Street Pedestrian Crossing sign and the Overhead Pedestrian Crossing sign shall not be used at signalized locations.**

**09 The STOP FOR legend shall only be used in States where the State law specifically requires that a driver must stop for a pedestrian in a crosswalk.**

**10 The In-Street Pedestrian Crossing sign shall have a black legend (except for the red-STOP or YIELD sign symbols) and border on a white background, surrounded by an outer yellow or fluorescent yellow-green background area (see Figure 2B-2). The Overhead Pedestrian Crossing sign shall have a black legend and border on a yellow or fluorescent yellow-green background at the top of the sign and a black legend and border on a white background at the bottom of the sign (see Figure 2B-2).**

**11 Unless the In-Street Pedestrian Crossing sign is placed on a physical island, the sign support shall be designed to bend over and then bounce back to its normal vertical position when struck by a vehicle.**

*Support:*

*12 The Provisions of Section 2A.18 concerning mounting height are not applicable for the In-Street Pedestrian Crossing sign.*

**Standard:**

**13 The top of an In-Street Pedestrian Crossing sign shall be a maximum of 4 feet above the pavement surface. The top of an In-Street Pedestrian Crossing sign placed in an island shall be a maximum of 4 feet above the island surface.**

*Option:*

*14 The In-Street Pedestrian Crossing sign may be used ~~seasonably~~ seasonally to prevent damage in winter because of plowing operations, and may be removed at night if the pedestrian activity at night is minimal.*

*15 In-Street Pedestrian Crossing signs, Overhead Pedestrian Crossing signs, and Yield Here To (Stop Here For) Pedestrians signs may be used together at the same crosswalk.*

### **Section 2B.13 Speed Limit Sign (R2-1)**

*Support:*

*00 The setting of speed limits can be controversial and requires a rational and defensible determination to maintain public confidence. Speed limits are normally set near the 85th-percentile speed that statistically represents one standard deviation above the average speed and establishes the upper limit of what is considered reasonable and prudent. As with most laws, speed limits need to depend on the voluntary compliance of the greater majority of motorists. Speed limits cannot be set arbitrarily low, as this would create violators of the majority of drivers and would not command the respect of the public.*

**Standard:**

**01 Speed zones (other than statutory speed limits) shall only be established on the basis of an engineering and traffic survey (E&TS) study that has been performed in accordance with traffic engineering practices. The engineering study shall include an analysis of the current speed distribution of free-flowing vehicles.**

**02 The Speed Limit (R2-1) sign (see Figure 2B-3) shall display the limit established by law, ordinance, regulation, or as adopted by the authorized agency based on the engineering study. The speed limits displayed shall be in multiples of 5 mph.**



**03 Speed Limit (R2-1) signs, indicating speed limits for which posting is required by law, shall be located at the points of change from one speed limit to another.**

**04 At the downstream end of the section to which a speed limit applies, a Speed Limit sign showing the next speed limit shall be installed. Additional Speed Limit signs shall be installed beyond major intersections and at other locations where it is necessary to remind road users of the speed limit that is applicable.**

**05 Speed Limit signs indicating the statutory speed limits shall be installed at entrances to the State and, where appropriate, at jurisdictional boundaries in urban areas.**

Support:

**06 In general, the maximum speed limits applicable to rural and urban roads are established:**

A. Statutorily – a maximum speed limit applicable to a particular class of road, such as freeways or city streets, that is established by State law; or

B. As altered speed zones – based on engineering studies.

**07 State statutory limits might restrict the maximum speed limit that can be established on a particular road, notwithstanding what an engineering study might indicate.**

Option:

~~08 If a jurisdiction has a policy of installing Speed Limit signs in accordance with statutory requirements only on the streets that enter a city, neighborhood, or residential area to indicate the speed limit that is applicable to the entire city, neighborhood, or residential area unless otherwise posted, a CITYWIDE (R2-5aP), NEIGHBORHOOD (R2-5bP), or RESIDENTIAL (R2-5cP) plaque may be mounted above the Speed Limit sign and an UNLESS OTHERWISE POSTED (R2-5P) plaque may be mounted below the Speed Limit sign (see Figure 2B-3).~~

Guidance:

*09 A Reduced Speed Limit Ahead (W3-5 or W3-5a) sign (see Section 2C.38) should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates the need for advance notice to comply with the posted speed limit ahead.*

*10 States and local agencies should conduct engineering studies at least once every 5, 7 or 10 years, in compliance with CVC Section 40802 to reevaluate non-statutory speed limits on segments of their roadways that have undergone significant changes since the last review, such as the addition or elimination of parking or driveways, changes in the number of travel lanes, changes in the configuration of bicycle lanes, changes in traffic control signal coordination, or significant changes in traffic volumes.*

*11 No more than three speed limits should be displayed on any one Speed Limit sign or assembly.*

~~12 When a speed limit within a speed zone is posted, it should be within 5 mph of the 85th percentile speed of free-flowing traffic.~~

Standard:

**12a When a speed limit is to be posted, it shall be established at the nearest 5 mph increment of the 85th-percentile speed of free-flowing traffic, except as shown in the two Options below.**

Option:

1. The posted speed may be reduced by 5 mph from the nearest 5 mph increment of the 85th-percentile speed, in compliance with CVC Sections 627 and 22358.5. See Standard below for documentation requirements.
2. For cases in which the nearest 5 mph increment of the 85th-percentile speed would require a rounding up, then the speed limit may be rounded down to the nearest 5 mph increment below the 85th percentile speed, if no further reduction is used. Refer to CVC Section 21400(b).

Standard:

**12b If the speed limit to be posted has had the 5 mph reduction applied, then an E&TS shall document in writing the conditions and justification for the lower speed limit and be approved by a registered Civil or Traffic Engineer. The reasons for the lower speed limit shall be in compliance with CVC Sections 627 and 22358.5.**

Support:

**12c** The following examples are provided to explain the application of these speed limit criteria:

**Example 1.** Using Option 1 above and first step is to round down: If the 85<sup>th</sup> percentile speed in a speed survey for a location was 37 mph, then the speed limit would be established at 35 mph since it is the closest 5 mph increment to the 37 mph speed. As indicated by the option, this 35 mph established speed limit could be reduced by 5 mph to 30 mph if



the conditions and justification for using this lower speed limit are documented in the E&TS and approved by a registered Civil or Traffic Engineer.

Example 2. Using Option 1 above and first step is to round up: If the 85<sup>th</sup> percentile speed in a speed survey for a location was 33 mph, then the speed limit would be established at 35 mph since it is the closest 5 mph increment to the 33 mph speed. As indicated by the option, this 35 mph speed limit could be reduced by 5 mph to 30 mph if the conditions and justification for using this lower speed limit are documented in the E&TS and approved by a registered Civil or Traffic Engineer.

Example 3. Using Option 2 above and first step is to round up: If the 85<sup>th</sup> percentile speed in a speed survey for a location was 33 mph, instead of rounding up to 35mph, the speed limit can be established at 30mph, but no further reductions can be applied (which is allowed in the two examples above).

**Standard:**

**<sup>12d</sup> Examples 1 and 2 for establishing posted speed limits shall apply to engineering and traffic surveys (E&TS) performed on or after July 1, 2009 in accordance with Caltrans' Traffic Operations Policy Directive Number 09-04 dated June 29, 2009.**

**Option:**

<sup>12e</sup> After January 1, 2012, Example 3 may be used to establish speed limits. Refer to CVC 21400(b).

**Support:**

<sup>12f</sup> Any existing E&TS that was performed before July 1, 2009 in accordance with previous traffic control device standards is not required to comply with the new criteria until it is due for reevaluation per the 5, 7 or 10 year criteria.

<sup>13</sup> *Speed studies for signalized intersection approaches should be taken outside the influence area of the traffic control signal, which is generally considered to be approximately 1/2 mile, to avoid obtaining skewed results for the 85<sup>th</sup>-percentile speed.*

**Support:**

<sup>14</sup> Advance warning signs and other traffic control devices to attract the motorist's attention to a signalized intersection are usually more effective than a reduced speed limit zone.

**Guidance:**

<sup>15</sup> *An advisory speed plaque (see Section 2C.08) mounted below a warning sign should be used to warn road users of an advisory speed for a roadway condition. A Speed Limit sign should not be used for this situation.*

**Option:**

<sup>16</sup> Other factors that may be considered when establishing or reevaluating speed limits are the following:

- A. Road characteristics, shoulder condition, grade, alignment, and sight distance;
- B. The pace;
- C. Roadside development and environment;
- D. Parking practices and pedestrian activity; and
- E. Reported crash experience for at least a 12-month period.

<sup>17</sup> Two types of Speed Limit signs may be used: one to designate passenger car speeds, including any nighttime information or minimum speed limit that might apply; and the other to show any special speed limits for trucks and other vehicles.

<sup>18</sup> A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided that the appropriate speed limit is displayed at the proper times.

<sup>19</sup> A changeable message sign that displays to approaching drivers the speed at which they are traveling may be installed in conjunction with a Speed Limit sign.

**Guidance:**

<sup>20</sup> *If a changeable message sign displaying approach speeds is installed, the legend YOUR SPEED XX MPH or such similar legend should be displayed. The color of the changeable message legend should be a yellow legend on a black background or the reverse of these colors.*

**Support:**

<sup>21</sup> Advisory Speed signs and plaques are discussed in Sections 2C.08 and 2C.14. Temporary Traffic Control Zone Speed signs are discussed in Part 6. The WORK ZONE (G20-5aP) plaque intended for installation above a Speed Limit sign is discussed in Section 6F.12. School Speed Limit signs are discussed in Section 7B.15.



<sup>22</sup> Speed limits in California are governed by the California Vehicle Code (CVC), Sections 22348 through 22413; also, pertinent sections are found in Sections 627 and 40802 and others referenced in this section. See Section 1A.11 for information regarding this publication.

<sup>23</sup> Refer to Part 6, Section 6C.01 for speed limit signs in temporary traffic control zones. Refer to Part 7 for speed limit signs in school areas.

### **Engineering and Traffic Survey (E&TS)**

Support:

<sup>24</sup> CVC Section 627 defines the term "Engineering and traffic survey" and lists its requirements.

**Standard:**

<sup>25</sup> **An engineering and traffic survey (E&TS) shall include, among other requirements deemed necessary by Caltrans, consideration of all of the following:**

- A. Prevailing speeds as determined by traffic engineering measurements.**
- B. Collision records.**
- C. Highway, traffic, and roadside conditions not readily apparent to the driver.**

Guidance:

<sup>26</sup> *The E&TS should contain sufficient information to document that the required three items of CVC Section 627 are provided and that other conditions not readily apparent to a driver are properly identified.*

<sup>27</sup> *Prevailing speeds are determined by a speed zone survey. A speed zone survey should include:*

- A. The intent of the speed measurements is to determine the actual speed of unimpeded traffic. The speed of traffic should not be altered by concentrated law enforcement, or other means, just prior to, or while taking the speed measurements.*
- B. Only one person is required for the field work. Speeds should be read directly from a radar or other electronic speed measuring devices; or,*
- C. Devices, other than radar, capable of accurately distinguishing and measuring the unimpeded speed of free flowing vehicles may be used.*
- D. A location should be selected where prevailing speeds are representative of the entire speed zone section. If speeds vary on a given route, more than one speed zone section may be required, with separate measurements for each section. Locations for measurements should be chosen so as to minimize the effects of traffic signals or stop signs.*
- E. Speed measurements should be taken during off-peak hours between peak traffic periods on weekdays. If there is difficulty in obtaining the desired quantity, speed measurements may be taken during any period with free flowing traffic.*
- F. The weather should be fair (dry pavement) with no unusual conditions prevailing.*
- G. The surveyor and equipment should not affect the traffic speeds. For this reason, an unmarked car is recommended, and the radar speed meter located as inconspicuously as possible.*
- H. In order for the sample to be representative of the actual traffic flow, the minimum sample should be 100 vehicles in each survey. In no case should the sample contain less than 50 vehicles.*
- I. Short speed zones of less than 0.5 miles should be avoided, except in transition areas.*
- J. Speed zone changes should be coordinated with changes in roadway conditions or roadside development.*
- K. Speed zoning should be in 10 mph increments except in urban areas where 5 mph increments are preferable.*
- L. Speed zoning should be coordinated with adjacent jurisdictions.*

Support:

<sup>28</sup> Physical conditions such as width, curvature, grade and surface conditions, or any other condition readily apparent to the driver, in the absence of other factors, would not require special downward speed zoning. Refer to CVC 22358.5.

Option:

<sup>29</sup> When qualifying an appropriate speed limit, local authorities may also consider all of the following findings:

- A. Residential density, if any of the following conditions exist on the particular portion of highway and the property contiguous thereto, other than a business district:**
  - 1. Upon one side of the highway, within 0.25 miles, the contiguous property fronting thereon is occupied by 13 or more separate dwelling houses or business structures.**
  - 2. Upon both sides of the highway, collectively, within a distance of 0.25 miles the contiguous property fronting thereon is occupied by 16 or more separate dwelling houses or business structures.**



3. The portion of highway is larger than 0.25 miles but has the ratio of separate dwelling houses or business structures to the length of the highway described in either subparagraph 1 or 2 above.

B. Pedestrian and bicyclist safety.

<sup>30</sup> The following two methods of conducting E&TS may be used to establish speed limits:

1. State Highways - The E&TS for State highways is made under the direction of the Caltrans District Traffic Engineer. The data includes:
  - a. One copy of the Example of Speed Zone Survey Sheet (See Figure 2B-101(CA)) showing:
    - A north arrow
    - Engineer's station or post mileage
    - Limits of the proposed zones
    - Appropriate notations showing type of roadside development, such as "scattered business," "solid residential," etc. Schools adjacent to the highway are shown, but other buildings need not be plotted unless they are a factor in the speed recommendation or the point of termination of a speed zone.
    - Collision rates for the zones involved
    - Average daily traffic volume
    - Location of traffic signals, signs and markings
    - If the highway is divided, the limits of zones for each direction of travel
    - Plotted 85<sup>th</sup> percentile and pace speeds at location taken showing speed profile
  - b. A report to the District Director that includes:
    - The reason for the initiation of speed zone survey.
    - Recommendations and supporting reasons.
    - The enforcement jurisdictions involved and the recommendations and opinions of those officials.
    - The stationing or reference post in mileage at the beginning and ending of each proposed zone and any intermediate equations. Location ties must be given to readily identifiable physical features.
2. City and County Through Highways, Arterials, Collector Roads and Local Streets.
  - a. The short method of speed zoning is based on the premise that a reasonable speed limit is one that conforms to the actual behavior of the majority of motorists, and that by measuring motorists' speeds, one will be able to select a speed limit that is both reasonable and effective. Other factors that need to be considered include but are not limited to: the most recent two-year collision record, roadway design speed, safe stopping sight distance, superelevation, shoulder conditions, profile conditions, intersection spacing and offsets, commercial driveway characteristics, and pedestrian traffic in the roadway without sidewalks.
  - b. Determination of Existing Speed Limits - Figures 2B-103(CA) & 2B-104(CA) show examples of data sheets which may be used to record speed observations. Specific types of vehicles may be tallied by use of letter symbols in appropriate squares.

<sup>31</sup> In most situations, the short form for local streets and roads will be adequate; however, the procedure used on State highways may be used at the option of the local agency.

*Guidance:*

<sup>32</sup> *The factors justifying a reduction below the 85<sup>th</sup> percentile speed for the posted speed limit are the same factors mentioned above. Whenever such factors are considered to establish the speed limit, they should be documented on the speed zone survey or the accompanying engineering report.*

<sup>33</sup> *The establishment of a speed limit of more than 5 mph below the 85<sup>th</sup> percentile speed should be done with great care as studies have shown that establishing a speed limit at less than the 85<sup>th</sup> percentile generally results in an increase in collision rates; in addition, this may make violators of a disproportionate number of the reasonable majority of drivers.*

*Support:*

<sup>34</sup> Generally, the most decisive evidence of conditions not readily apparent to the driver surfaces in collision histories.

<sup>35</sup> Speed limits are established at or near the 85<sup>th</sup> percentile speed, which is defined as that speed at or below which 85<sup>th</sup> percent of the traffic is moving. The 85<sup>th</sup> percentile speed is often referred to as the critical speed. Pace speed is defined as the 10 mph increment of speed containing the largest number of vehicles (See Figure 2B-102(CA)). The lower limit of the pace is plotted on the Speed Zone Survey Sheets as an aid in determining the proper zone limits. Speed limits higher than the 85<sup>th</sup> percentile are not generally considered reasonable and prudent. Speed limits below the 85<sup>th</sup> percentile do not ordinarily



facilitate the orderly movement of traffic and require constant enforcement to maintain compliance. Speed limits established on the basis of the 85<sup>th</sup> percentile conform to the consensus of those who drive highways as to what speed is reasonable and prudent, and are not dependent on the judgment of one or a few individuals.

<sup>36</sup> The majority of drivers comply with the basic speed law. Speed limits set at or near the 85<sup>th</sup> percentile speed provide law enforcement officers with a limit to cite drivers who will not conform to what the majority considers reasonable and prudent. Further studies show that establishing a speed limit at less than the 85<sup>th</sup> percentile (Critical Speed) generally results in an increase in collision rates.

Option:

<sup>37</sup> When roadside development results in traffic conflicts and unusual conditions which are not readily apparent to drivers, as indicated in collision records, speed limits somewhat below the 85<sup>th</sup> percentile may be justified. Concurrence and support of enforcement officials are necessary for the successful operation of a restricted speed zone.

Guidance:

<sup>38</sup> *Speed zones of less than 0.5 miles and short transition zones should be avoided.*

## **Signs**

**Standard:**

<sup>39</sup> **The Speed Limit (R2-1) sign shall be used to give notice of a prima facie or maximum speed limit except as provided under Prima Facie Speed Limits in CVC 22352.**

<sup>40</sup> **When used, the TRUCKS, 3 AXLES OR MORE 55 MAXIMUM (R6-3(CA)) sign shall be installed approximately 750 feet following each R2-1 sign.**

<sup>41</sup> **The ALL VEHICLES WHEN TOWING 55 MAXIMUM (R6-4(CA)) sign shall be installed approximately 750 feet following the R6-3(CA) sign.**

Guidance:

<sup>42</sup> *The R6-3(CA) and R6-4(CA) signs should be placed on highway segments where speeds in excess of 55 mph are permitted.*

Option:

<sup>43</sup> The existing AUTOS WITH TRAILERS, TRUCKS 55 MAXIMUM (R6-1(CA)) sign may remain in place until it is knocked down, damaged, stolen, vandalized, or otherwise reaches the end of its useful life.

<sup>44</sup> The local California Highway Patrol office may be consulted to identify highway segments where enforcement is an issue. On these segments early replacement of existing R6-1(CA) signs may be necessary.

Support:

<sup>45</sup> Refer to CVC Section 22406 for types of vehicles subject to the 55 mph maximum speed limit.

Option:

<sup>46</sup> The Speed Zone Ahead (R2-4(CA)) sign (see Figure 2B-3(CA)) may be used to inform the motorist of a reduced speed zone.

**Standard:**

<sup>47</sup> **The R2-4(CA) sign shall always be followed by a Speed Limit (R2-1) sign installed at the beginning of the zone where the reduced speed limit applies.**

<sup>48</sup> **The End Speed Limit (R3(CA)) sign shall only be used to mark the end of a speed zone.**

<sup>49</sup> **The R3(CA) sign shall not be used at a transition into a change in speed limits within a reduced zone.**

Option:

<sup>50</sup> The R3(CA) sign (see Figure 2B-3(CA)) may be used with the TRUCK (M4-4) plaque to mark the end of truck speed zones on descending grades.

**Standard:**

<sup>51</sup> **Speed limit signs shall be placed at the beginning of all restricted speed zones.**

Option:

<sup>52</sup> Where speed zones are longer than 1 mile, intermediate signs may be placed at approximate 1 mile intervals. For three or more lanes in each direction, dual installation may be used.

**Standard:**

<sup>53</sup> **The Speed Limit (R2-1) and End Speed Limit (R3(CA)) signs, as appropriate shall be placed at the end of all restricted speed zones.**

<sup>54</sup> **Freeways with 65 mph and those segments where a speed limit of 70 mph has been approved by Caltrans, with approval by the California Highway Patrol, shall be posted as follows:**

- **At the segment entrance, R2-1 signs shall be installed right of traffic off of the right shoulder.**
- **R2-1 signs shall also be installed off of the right shoulder only, throughout the segment, at a maximum of 25 mile intervals.**

**Option:**

- **The 25 mile interval may be modified to include locations following entrance ramps.**

**Standard:**

- **The R6-3(CA) sign (see Figure 2B-3(CA)) shall be installed approximately 750 feet following each R2-1 sign, both at the beginning and throughout each 60, 65 or 70 mph segment.**
- **The R6-4(CA) sign (see Figure 2B-3(CA)) shall be installed approximately 750 feet following each R6-3(CA) sign.**

**Option:**

- **The SLOWER TRAFFIC KEEP RIGHT (R4-3) signs may be installed at locations where there is a tendency of the motorists to drive in the left-hand lane(s) below the normal speed of traffic.**

**Standard:**

- **Signs shall be placed in protected locations.**
- **At the end of the 70/65 mph segment, R2-1 signs shall be installed off of the right shoulder.**

<sup>55</sup> **Freeway segments where a 55 mph speed limit has been approved by Caltrans, with the approval of the California Highway Patrol, shall be posted as follows:**

- **The beginning of the segment shall be posted with an R2-1 sign installed on the right shoulder and left shoulder where the median is of sufficient width to permit sign maintenance without lane closures.**

**Guidance:**

- *Subsequent signs should then be posted on the right shoulder, on approximate 3 mile intervals, with no more than 3 interchanges between signs.*
- *At the end of the segment, an R2-1 sign with the appropriate number for the next speed limit should be posted on the right shoulder.*

<sup>56</sup> *Conventional highways with 55 mph speed limits should be posted as follows:*

**Standard:**

- **The beginning of the segment shall be posted with an R2-1 sign installed on the right shoulder.**

**Guidance:**

- *Subsequent signs should then be posted on approximate 5 to 10 mile intervals and immediately after locations where significant volumes of traffic enter the segment.*
- *At the end of the segment, an R2-1 sign with the appropriate number for the next speed limit should be posted on the right shoulder.*

*Conventional highways with 65 mph speed limits should be posted as follows:*

- *The beginning of the segment should be posted with an R2-1 sign installed on the right shoulder.*
- *Subsequent signs should then be posted at 5 to 10 mile intervals and after locations where significant volumes of traffic enter the segment.*
- *At the end of the segment, an R2-1 sign with the appropriate number for the next speed limit should be posted on the right shoulder.*

**Option:**

<sup>57</sup> *Pavement markings with appropriate numerals (see Section 3B.21) may be used to supplement speed limit signs.*

**Standard:**

<sup>58</sup> **The R2-1 and R6-3(CA) and R6-4(CA) signs giving maximum statewide speed limits for various types of vehicles shall be installed on all State highways near the points of entrance into California.**



*Guidance:*

<sup>59</sup> *The R2-1 and R6-3(CA) and R6-4(CA) signs should be placed in a location to be most effectively viewed by the approaching motorists.*

**Standard:**

<sup>60</sup> **Speed Limit (R2-1) signs shall be installed throughout segments of freeway with posted speed limits of 65 mph or 70 mph at a maximum of 25 mile intervals.**

*Option:*

<sup>61</sup> The 25 mile interval may be modified to include locations following entrance ramps.

**Standard:**

<sup>62</sup> **Speed Limit (R2-1) signs shall be installed throughout segments of conventional highways with a posted speed limit of 65 mph at 5 mile to 10 mile intervals.**

<sup>63</sup> **Speed Limit (R2-1) signs shall be installed throughout segments of freeway with a posted speed limit of 55 mph at approximately 3 mile intervals with no more than 3 interchanges between signs.**

<sup>64</sup> **Speed Limit (R2-1) signs shall be installed throughout segments of conventional highways with a posted speed limit of 55 mph at 5 mile to 10 mile intervals.**

**Speed Enforced Signs**

*Option:*

<sup>65</sup> The SPEED ENFORCED BY RADAR (R48(CA)) sign (see Figure 2B-3(CA)) may be used where the California Highway Patrol has received authority to use radar and requests such signs.

*Guidance:*

<sup>66</sup> *One sign should be used in each direction at the beginning of the segment of roadway, and at intervening major route intersections, where radar enforcement is in effect.*

*Support:*

<sup>67</sup> The R48(CA) sign is a stand-alone sign intended to alert motorists that speed is enforced by radar on a particular segment of roadway.

*Option:*

<sup>68</sup> The RADAR ENFORCED (R48-1(CA)) sign (see Figure 2B-3(CA)) may be used in combination with the Speed Limit (R2-1) sign on any roadway where law enforcement has the authority to use radar.

*Guidance:*

<sup>69</sup> *When used, the R48-1(CA) sign should be placed below the R2-1 sign, at the beginning of the segment of roadway and at intervening major intersections, where radar enforcement is in effect.*

*Option:*

<sup>70</sup> The SPEED ENFORCED BY AIRCRAFT (R48-2(CA)) sign (see Figure 2B-3(CA)) may be placed, when requested by the California Highway Patrol, on sections of highway regularly patrolled by aircraft.

**Standard:**

<sup>71</sup> **The R48-2(CA) sign shall be used for both directions of travel.**

*Guidance:*

<sup>72</sup> *The R48-2(CA) sign should be placed at the beginning of the section and spaced at 25 mile intervals. See Figure 3B-105(CA).*

**Vehicle Speed Feedback Signs**

*Option:*

<sup>73</sup> A Vehicle Speed Feedback sign that displays to approaching drivers the speed at which they are traveling may be installed in conjunction with a Speed Limit (R2-1) sign.

**Standard:**

<sup>74</sup> **If a Vehicle Speed Feedback sign displaying approach speeds is installed, the legend shall be YOUR SPEED XX. The numerals displaying the speed shall be white, yellow, yellow-green or amber color on black background. When activated, lights shall be steady-burn conforming to the provisions of CVC Sections 21466 and 21466.5. Vehicle Speed Feedback signs shall not alternatively be operated as variable speed limit signs.**

*Guidance:*

<sup>75</sup> To the degree practical, numerals for displaying approach speeds should be similar font and size as numerals on the corresponding Speed Limit (R2-1) sign.

*Option:*

<sup>76</sup> When used, the Vehicle Speed Feedback sign may be mounted on either a separate support or on the same support as the Speed Limit (R2-1) sign.

<sup>77</sup> In lieu of lights, legend may be retroreflective film for flip-disk systems.

<sup>78</sup> The legend YOUR SPEED may be white on black plaque located above the changeable speed display.

*Support:*

<sup>79</sup> Driver comprehension may improve when the Vehicle Speed Feedback Sign is mounted on the same support below the Speed Limit (R2-1) sign.

<sup>80</sup> Vehicle Speed Feedback Signs are appropriate for use with advisory speed signs and with temporary signs in temporary traffic control zones.

**Basic Speed Law and Prima Facie Speed Limits – See CVC 22350 & 22352**

*Support:*

<sup>81</sup> The basic speed law states “No person shall drive a vehicle upon a highway at a speed greater than is reasonable or prudent having due regard for weather, visibility, the traffic on, and the surface and width of, the highway, and in no event at a speed which endangers the safety of persons or property.”

**Standard:**

<sup>82</sup> **Prima facie speed limits are specific limits and shall apply unless changed based upon an engineering and traffic survey (E&TS) and signs are posted that display the new speed limit.**

*Option:*

<sup>83</sup> Prima facie speed limits may be preempted by the basic speed law, when roadway, traffic or weather conditions warrant a lower speed.

**Use of Metric System Designations – See CVC 21351.3**

*Option:*

<sup>84</sup> Dual units for speed limits on signs may be placed on local streets and roads in both Metric and English units.

*Guidance:*

<sup>85</sup> If used, dual unit speed limits should be rounded to the nearest 10 km/h for Metric and 5 mph for English units for posting on signs on local streets and roads.

*Support:*

<sup>86</sup> Refer to AASHTO's Traffic Engineering Metric Conversion Factors. See Section 1A.11 for information regarding this publication.

**Standard:**

<sup>87</sup> **Metric speed limits shall not be placed on State highways. For use in this California MUTCD, 70 mph shall be shown as a metric equivalent of 110 km/h, neither of which shall be used on any local street or road.**

**Legal Authority for Establishing Speed Limits**

*Support:*

<sup>88</sup> Delegation of legal authority to set speed limits on State highways is given to Caltrans District Directors. The District Director of each transportation district is authorized to issue orders regulating the speed of traffic, up to 65 mph on State highways. The Director of Caltrans retains the authority to approve variable, minimum, and maximum speeds up to 70 mph on State freeways.

**Standard:**

<sup>89</sup> **The speed limits shown in Table 2B-101(CA) shall apply, unless changed upon the basis of an engineering and traffic survey (E&TS).**

*Option:*

<sup>90</sup> The speed limits shown in Table 2B-102(CA) may apply, unless changed upon E&TS.



### **Variable Speed Limits on Freeways - See CVC 22355**

Option:

<sup>91</sup> The following speed limits may apply:

- Whenever Caltrans determines based upon an engineering and traffic survey (E&TS) that the safe and orderly movement of traffic upon any freeway segment will be facilitated by the establishment of variable speed limits.
- Caltrans may erect, regulate, and control signs upon the state highway which is a freeway, or any portion thereof, which, if used, signs shall be designed to permit display of different speeds at various times of the day or night.
- Such signs need not conform to the standards & specifications per CVC 21400, but if used, shall be of sufficient size and clarity to give adequate notice of the applicable speed limit.

### **Minimum Speed Limits on State Highways - See CVC 22400**

Option:

<sup>92</sup> The following speed limits may apply:

- Whenever Caltrans determines based upon an engineering and traffic survey (E&TS) that slow speeds on any part of a state highway consistently impede the normal and reasonable movement of traffic, Caltrans may determine and declare a minimum speed limit. Appropriate signs giving notice shall then be installed on that segment.
- A motorist can be cited for stopping or impeding the normal and reasonable movement of traffic unless the stop is necessary for safe operation and in compliance with the law.

### **Speed Traps**

Support:

<sup>93</sup> Refer to CVC 40802 for Speed Traps.

Standard:

<sup>94</sup> **A speed trap shall not apply to a local street, road, or school zone.**

<sup>95</sup> **A section of highway shall be defined as a speed trap if the prima facie speed limit is not justified by an engineering and traffic survey (E&TS) within five years, and the enforcement of the speed limit involves the use of radar or any other electronic device that measures the speed of moving objects.**

<sup>96</sup> **This time provision shall be extended to seven years when using radar and all of the following criteria are met:**

- **The arresting officer has successfully completed a minimum of 24 hours of certified radar operator course training.**
- **The radar used to measure the speed meets or exceeds the minimal operational standards of the National Traffic Highway Safety Administration, and has been calibrated within three years of the alleged violation.**

<sup>97</sup> **This time provision shall be extended to seven years when using laser or other electronic device (other than radar) and all of the following criteria are met:**

- **The arresting officer has successfully completed a minimum of 24 hours of certified radar operator course training.**
- **The arresting officer has successfully completed a minimum of 2 hours of additional approved certified training.**
- **The radar used to measure the speed meets or exceeds the minimal operational standards of the National Traffic Highway Safety Administration, and has been calibrated within three years of the alleged violation.**

Option:

<sup>98</sup> This time provision for an E&TS may be extended to ten years when all of the above conditions are met and no significant changes in roadway or traffic conditions have occurred, including changes in adjoining property or land use, roadway width, or traffic volume as determined by a registered engineer.

### **Truck Speed Zone on Descending Grades**

Guidance:

<sup>99</sup> *Highway descending grades, if used for posting TRUCK Speed Limit signs (R2-1 and M4-4) for trucks travelling downhill, should have recorded incident history of runaway commercial vehicles. Descending grades shorter than 1 mile should be avoided for posting signs because deceleration of vehicles due to braking action can generally provide sufficient control on descending grades of less than 1 mile.*



**Support:**

<sup>100</sup> To establish a downhill truck speed limit, a physical profile showing length and gradient and a downhill speed profile for three or more axle commercial vehicles with a gross rating of 10,000 lbs. or more will be provided.

**Standard:**

<sup>101</sup> **Speed profiles for truck speed limits shall be prepared on the same form as other speed surveys. An analysis of collisions involving trucks shall be prepared.**

**Guidance:**

<sup>102</sup> *Posted speeds should be on the low side of the scale, generally within the pace of loaded commercial vehicles.*

**Standard:**

<sup>103</sup> **If warranted, the Caltrans District Director shall issue a standard speed zone order.**

**Support:**

<sup>104</sup> Posting of the regulation will be by placement of a standard 36 x 45 inch Speed Limit (R2-1) sign with a TRUCK (M4-4) plate above.

**Standard:**

<sup>105</sup> **A standard End Speed Limit (R3(CA)) sign with TRUCK (M4-4) plate shall be posted at the end of the truck zone when appropriate.**

**Speed Zones in Temporary Traffic Control Areas**

**Support:**

<sup>106</sup> For signing and establishing speed zones in temporary traffic control areas, refer to Section 6C.01 in Part 6.

**Section 2B.14 Truck Speed Limit Plaque (R2-2P)**

**Standard:**

<sup>01</sup> **Where a special speed limit applies to trucks or other vehicles, the legend TRUCKS XX or such similar legend shall be displayed below the legend Speed Limit XX on the same sign ~~or on a separate R2-2P plaque (see Figure 2B-3) below the standard legend.~~**

<sup>02</sup> **The Truck Speed Limit (R2-2) sign shall not be used in California. The TRUCK (M4-4) plaque placed above the Speed Limit (R2-1) sign shall be used instead.**

<sup>03</sup> **The TRUCK (M4-4) plaque shall be placed above the Speed Limit (R2-1) sign to indicate the truck speed limit. It shall also be placed above the End Speed Limit (R3(CA)) sign to mark the end of truck speed limits.**

**Support:**

<sup>04</sup> Refer to Section 2B.13 for more details.

**Section 2B.15 Night Speed Limit Plaque (R2-3P)**

**Standard:**

<sup>01</sup> **Where different speed limits are prescribed for day and night, both limits shall be posted.**

**Guidance:**

<sup>02</sup> *A Night Speed Limit (R2-3P) plaque (see Figure 2B-3) should be reversed using a white retroreflectorized legend and border on a black background.*

**Option:**

<sup>03</sup> A Night Speed Limit plaque may be combined with or installed below the standard Speed Limit (R2-1) sign.

**Support:**

<sup>04</sup> Refer to CVC 22355.

**Section 2B.16 Minimum Speed Limit Plaque (R2-4P)**

**Standard:**

<sup>01</sup> **A Minimum Speed Limit (R2-4P) plaque (see Figure 2B-3) shall be displayed only in combination with a Speed Limit sign.**

**Option:**

<sup>02</sup> Where engineering judgment determines that slow speeds on a highway might impede the normal and reasonable movement of traffic, the Minimum Speed Limit plaque may be installed below a Speed Limit (R2-1)

# **APPENDIX C**

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## **Traffic Radar Certifications**

*Traffic Radar Equipment Certification*

*Traffic Radar Operator Certification*





# TRAFFIC RADAR CERTIFICATION

TESTED TO NHTSA SPECIFICATIONS / IACP CRITICAL PERFORMANCE STANDARDS  
(NHTSA) National Highway and Traffic Safety Administration.  
(IACP) International Association of Chiefs of Police.

16202 Keats Circle  
Westminster, Calif. 92683

R.H.F. is a certified independent testing and repair facility.

1	TEST ID	Date Received <i>11-20-18</i>	Certification Number <i>73563</i>							
2	DEVICE ID	Make <b>Decatur</b>	Model <b>Genesis VP or VPD</b>	Type (I-IV) <b>III</b>	Directional radar <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Same direction <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
		Counting unit S/N <i>1413</i>	Antenna-1 S/N <b>N/A</b>		Antenna-2 S/N <b>N/A</b>					
3	§ 2.4 / § 5.4 TUNING FORK CALIBRATION	Low speed fork S/N <i>101052</i>	Last date calib.	Freq. (Hz)	Speed (mph) <i>33</i>	Measured (Hz) <i>2390</i>	<b>PASS</b>	FAIL		
		High speed fork S/N <i>101209</i>	Last date calib.	Freq. (Hz)	Speed (mph) <i>77</i>	Measured (Hz) <i>5591</i>				
4	§ 2.5 / § 5.5 RADAR DEVICE TUNING FORK TESTS			Lo fork		High fork		<b>PASS</b>	FAIL	
		Stationary mode		Fork speed (mph) <b>33</b>			<b>77</b>			
				Disp. Speed (mph) <i>33</i>			<i>77</i>			
		Moving mode Opposite Direction		TARGET SPEED (Hi fork - Lo fork)	Expected. (mph)					Displayed. (mph) <b>N/A</b>
Moving mode Same Direction		TARGET SPEED Hi fork + Lo fork Hi fork - Lo fork	Expected. (mph)			Displayed. (mph) <b>N/A</b>				
5	§ 2.6.1. / § 5.6.1 TRANSMISSION FREQUENCY STABILITY	Standard supply Voltage (V) <b>7.2 V</b>	Antenna 1 Freq. GHz <i>24.171</i>	Antenna 2 Freq. GHz <b>N/A</b>		<b>PASS</b>	FAIL			
		Standard supply Voltage - 20% (V) <b>6.2 V</b>	Antenna 1 Freq. GHz <i>N/A</i>	Antenna 2 Freq. GHz <b>N/A</b>						
		Standard supply voltage + 20% (V) <b>8.6 V</b>	Antenna 1 Freq. GHz <i>N/A</i>	Antenna 2 Freq. GHz <b>N/A</b>						
6	§ 2.6.5 / § 5.6.5 POWER DENSITY	Mfg. Spec. (max mW/cm) <b>≤ 2</b>	Antenna 1 Power (mW/cm) <i>0.34</i>	Antenna 2 Power (mW/cm) <b>N/A</b>		<b>PASS</b>	FAIL			
7	§ 2.8 / § 5.8 LOW VOLTAGE	Mfg. spec. (V) <b>≤ 6.2 V</b>	LVA activates (V) <i>N/A</i>	LVA deactivates (V) <i>N/A</i>		PASS	FAIL			
8	§ 2.9.1 / § 5.9.1 DOPPLER AUDIO	A. Audio tone correlates with received Doppler signal <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			B. Functioning audio volume-adjustment control <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<b>PASS</b>	FAIL		
9	§ 2.12.4 / § 5.12.4 INTERNAL CIRCUIT	Mfg. Spec. <b>PASS</b>	Test results <i>PASS</i>			<b>PASS</b>	FAIL			
10	§ 2.12.6.5 / § 5.12.6.5 DIRECTIONAL	A. Selects only targets moving towards radar <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N.A.			B. Selects only targets moving away from radar <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N.A.		<b>PASS</b>	FAIL		
11	§ 2.12.7 / § 2.12.8 / 5.12.7 / 5.12.8 LOW AND HIGH SPEED DISPLAY TEST	Stationary mode: target channel (mph)		Low speed spec. <b>5</b>	Lo speed disp. <i>5</i>		<b>PASS</b>	FAIL		
				Hi speed spec. <b>200</b>	Hi speed disp. <i>200</i>					
		Moving Mode target channel (mph)		Low speed spec. <b>N/A</b>	Lo speed disp. <b>N/A</b>					
				Hi speed spec. <b>N/A</b>	Hi speed disp. <b>N/A</b>					
Moving Mode: patrol channel (mph)		Low speed spec. <b>N/A</b>	Lo speed disp. <b>N/A</b>							
		Hi speed spec. <b>N/A</b>	Hi speed disp. <b>N/A</b>							
12	§ 2.13 / § 5.13 RFI TEST						<b>PASS</b>	FAIL		
13	LABORATORY COMMENTS									
14	NHTSA/IACP CERTIFICATION	<p><i>This radar device meets or exceeds the minimal operational standards of the National Traffic Highway Safety Administration. California Vehicle Code Section 40802</i> <input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL</p> <p>Certified by: <i>Fred Bauman</i> Date: <i>11-20-18</i></p>								
15	INVENTORY	<input type="checkbox"/> Fork Cert <input type="checkbox"/> Manual <input type="checkbox"/> 2 <sup>nd</sup> Ant. <input type="checkbox"/> Remote <input type="checkbox"/> Bat. <input type="checkbox"/> Carrying Case <input type="checkbox"/> Other: (please list)								



# CERTIFICATE OF COMPLETION

## THIS IS TO CERTIFY THAT –

1. Thomas L. Hartman of Albert Grover and Associates Traffic Engineering firm has successfully completed a course for Traffic Engineers on the operation of Radar devices in application with Traffic and Engineering Speed Surveys as outlined in the California Vehicle Code and the Manual of Uniform Traffic Control Devices. This course is based upon the standards as outlined by the National Highway Traffic Safety Administration, California Commission on P.O.S.T standards and Section 40802 of the California Vehicle Code.
2. Thomas L. Hartman completed the classroom instruction on operation and theory of Radar devices, case law, traffic and engineering surveys, the California Vehicle Code as well as the test, set-up, operation and identification of erroneous readings.
3. Thomas L. Hartman, in field settings demonstrated competence in the test and set-up of a radar device, operation and trouble shooting of the device and correct evaluation of readings provided by the device.
4. Thomas L. Hartman Roland P. Hizon demonstrated competence in making visual speed estimations in actual field settings.
5. Thomas L. Hartman of Albert Grover and Associates Traffic Engineering firm is recognized for his competence as a Radar Operator this 30th day of November, 2018.



Steve Chauncey  
P.O.S.T. Certified Radar Instructor